

We claim:

1. A method of depositing an optical quality silica film by PECVD (Plasma Enhanced Chemical Vapor Deposition), comprising:
  - a) independently setting a predetermined flow rate for a raw material gas;
  - 5 b) independently setting a predetermined flow rate for an oxidation gas;
  - c) independently setting a predetermined flow rate for a carrier gas;
  - d) independently setting a predetermined total deposition pressure; and
  - e) applying a post deposition heat treatment to the deposited film at a temperature selected to optimize the mechanical properties without affecting the optical properties
- 10 determined in steps *a* to *d*.
2. A method as claimed in claim 1, further comprising independently setting a predetermined flow rate for a dopant gas.
3. A method as claimed in claim 2, wherein the observed FTIR characteristics of the deposited film are monitored to determine the optimum post deposition heat treatment
- 15 temperature.
4. A method as claimed in claim 1, wherein the post deposition heat treatment temperature lies in the range 600 to 900°C.
5. A method as claimed in claim 4, wherein the deposition is carried out at a temperature in the range 100 to 650°C.
- 20 6. A method as claimed in claim 5, wherein the deposition is carried out at a temperature of about 400°C.
7. A method as claimed in claim 1, wherein the raw material gas is selected from the group consisting : silane,  $\text{SiH}_4$ ; silicon tetra-chloride,  $\text{SiCl}_4$ ; silicon tetra-fluoride,  $\text{SiF}_4$ ; disilane,  $\text{Si}_2\text{H}_6$ ; dichloro-silane,  $\text{SiH}_2\text{Cl}_2$ ; chloro-fluoro-silane  $\text{SiCl}_2\text{F}_2$ ; difluoro-silane,  $\text{SiH}_2\text{F}_2$ ; and any other silicon containing gas containing hydrogen, H, chlorine, Cl, fluorine, F, bromine, Br, or iodine, I.
- 25 8. A method as claimed in claim 7, wherein the oxidation gas is selected from the group consisting of: nitrous oxide,  $\text{N}_2\text{O}$ ;  $\text{O}_2$ , nitric oxide,  $\text{NO}_2$ ; water,  $\text{H}_2\text{O}$ ; hydrogen peroxide,  $\text{H}_2\text{O}_2$ ; carbon monoxide,  $\text{CO}$ ; and carbon dioxide,  $\text{CO}_2$ .

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9. A method as claimed in claim 8, wherein the carried gas is selected from the group consisting of nitrogen,  $N_2$ ; helium, He; neon, Ne; argon, Ar; or krypton, Kr.
10. A method as claimed in claim 2, wherein the dopant gas is selected from the group consisting of phosphene,  $PH_3$ ; diborane,  $B_2H_6$ ; Arsine ( $AsH_3$ ); Titanium hydride,  $TiH_4$ ; germane,  $GeH_4$ ; Silicon Tetrafluoride,  $SiF_4$ ; and carbon tetrafluoride,  $CF_4$ .
11. A method as claimed in claim 2, wherein the raw material gas is  $SiH_4$ , the oxidation gas is  $N_2O$ , the carrier gas is  $N_2$ , and the dopant gas is  $PH_3$ .
12. A method as claimed in claim 11, wherein the  $SiH_4$  gas flow is set at about 0.2 std liters/min., the  $N_2O$  gas flow is set at about 6.00 std liters/min., the  $N_2$  flow is set at about 3.15 liters/min., and the  $PH_3$  is set at about 0.50 std liters/min.
13. A method of depositing an optical quality silica film by PECVD (Plasma Enhanced Chemical Vapor Deposition), comprising:
- a) independently setting a flow rate for  $SiH_4$  at about 0.2 std liters/min.;
  - b) independently setting a flow rate for  $N_2O$  at about 6.00 .2 std liters/min.;
  - c) independently setting a flow rate for a carrier gas;
  - d) independently setting a predetermined total deposition pressure; and
  - e) applying a post deposition heat treatment to the deposited film at a temperature between  $600^\circ$  and  $900^\circ C$  selected to optimize the mechanical properties without affecting the optical properties determined in steps *a* to *d*.
14. A method as claimed in claim 13, wherein the carrier gas is  $N_2$  and the flow rate is set at about 3.15 2 std liters/min.
15. A method as claimed in claim 14, further comprising independently setting a predetermined flow rate for a dopant gas.
16. A method as claimed in claim 15, wherein the dopant gas is  $PH_3$  and the flow rate is set at about 0.50 std liters/min.
- 17., A method as claimed in claim 15, wherein the total deposition pressure is set at about 2.6 Torr.

18. A method as claimed in claim 13, wherein the observed FTIR characteristics of the deposited film are monitored to determine the optimum post deposition heat treatment temperature.

19. A method as claimed in claim 13, wherein said deposited film forms a buffer, core  
5 or cladding of an optical component.

20. A method as claimed in claim 19, wherein said optical component is a multiplexer or demultiplexer.

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